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# ENGLISH-RUSSIAN CROSS-LINGUISTIC COMPARISON OF RESEARCH ARTICLE ABSTRACTS IN GEOSCIENCE

## ANÁLISIS CONTRASTIVO INGLÉS-RUSO DE RESÚMENES DE ARTÍCULOS DE INVESTIGACIÓN DEL ÁMBITO DE GEOCIENCIAS

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**Resumen**

Un buen dominio del género textual del *Resumen* resulta fundamental para satisfacer las expectativas de la comunidad científica. Hasta la fecha ya contamos con diferentes investigaciones sobre este género en diversas disciplinas, si bien el *Resumen* en el ámbito de geociencias ha sido menos estudiado. Por otro lado, el enfoque adoptado en la mayoría de esos estudios se basa en las dicotomías *nativo/no nativo*. No obstante, el análisis de los resúmenes escritos por rusohablantes todavía presenta un campo de investigación poco explorado. El presente trabajo tiene por objetivo llevar a cabo una comparación lingüística de resúmenes escritos en inglés por geocientíficos noveles rusos, por un lado, y por expertos ingleses nativos, por el otro. Para ello se ha recopilado un corpus de resúmenes geocientíficos en

**Abstract**

Mastering the genre of the research article abstract is crucially important to meet the expectations of a discourse community in a particular scientific field. To date, research has shed light on how abstracts are written in various disciplines. However, few if any attempts have been made to analyse the abstract in geoscience. Furthermore, several studies have investigated the genre of abstract drawing on *native*/*non-native*, *expert*/*apprentice* dichotomies. Even so, there has not been sufficient investigation into abstracts written by Russian native speakers. This study therefore aims to carry out a cross-linguistic comparison of abstracts written in English by Russian novice researchers and native English-speaking experts in geoscience. For this purpose, a monolingual English corpus of research articles in geoscience was created.

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inglés. El análisis multidimensional del corpus generalmente confirma los estudios previos sobre el tema, sin embargo, ha mostrado unas características diferentes en los resúmenes rusos.

PALABRAS CLAVE: escritura académica, resumen de artículo de investigación, discurso especializado, lingüística de corpus, análisis discursivo contrastivo.

The results of Biber's multidimensional analysis generally confirm previous findings about abstracts in hard sciences, though they allow for hypotheses on some distinctive features of abstracts written by Russian geoscientists.

KEYWORDS: academic writing, abstract in geoscience, disciplinary discourse, corpus linguistics, genre analysis.

## 1. INTRODUCTION

Writing is perhaps the most important language skill in English for Academic Purposes (EAP). It is an essential part of students' life, yet a very challenging skill to develop. Writing like an expert means success at university and within the scientific community. However, it can be a tricky task even for native speakers, to say nothing of foreign students. Besides controlling their grammar, they need to know what a specific discourse community expects from them. There is much to learn, such as how to avoid plagiarism, what style is appropriate and, most importantly, different genres of EAP writing.

Among the genres usually studied by EAP learners, there is obviously the research article (RA) and its abstract. The latter is often seen as an independent genre (Nwogu & Bloor 1991; Lorés 2004) and as the quintessence and ultimate example of academic writing. The rhetorical organisation and the linguistic features of the abstract have therefore been scrutinised and examined by various researchers. It was discovered that rhetorical moves and linguistic properties are not universal in all RA abstracts, but are rather discipline-specific (Dudley-Evans 1994; Hyland 2000; Hyland & Hamp-Lyons 2002; Stotesbury 2003; Busá 2005; Ayers 2008). The most prominent difference is seen between so-called *hard* and *soft* science abstracts. However, writing an abstract in each particular discipline deserves a more detailed investigation.

To date, research has shed light on abstracts in medicine (Salager-Meyer 1992; Anderson & Maclean 1997), applied linguistics (Lorés 2004; Hu & Cao 2011; Tseng 2011; Pho, 2013), biology (Samraj 2005), astrophysics (Rashidi & Ghaffarpour 2012), engineering (Abarghooeinezhad & Simin 2015) and other disciplines. However, few if any attempts have been made to analyse and describe the peculiarities of this genre in geoscience. Most information about them is advisory in nature, that is to say it appears in handbooks of writing on geoscience (e.g., Bates *et alii* 1995; Donovan 2017) or leaflets with writing tips for students (e.g., Davis 2012; Taylor n.d). However, there have not been sufficient studies founded upon a robust evidential base. Therefore, this study is an attempt to fill the gap in empirical research into the abstract in geoscience by building a corpus of such abstracts.

An equally important line of research has been dedicated to contrasting native and non-native EAP writing, with RA abstracts in particular. National academic conventions vary from country to country (Spillner 1996), though the native English-speaking academic tradition remains dominant in most reputable international journals (Tribble

2017). This means that to publish RA successfully, non-native students need to know the principles of developing and organising ideas in academic discourse in English. A number of comparative studies in English and other languages have been carried out in this regard. For example, Martín (2003), Sanz (2006), Perales-Escudero & Swales (2011) and Alonso Almeida (2014) contrasted abstracts by native Anglo-American and Spanish authors. Other studies compared English with Chinese (Hu & Cao 2011; Yang 2013), German (Busch-Lauer 1995), French (Van Bonn & Swales 2007) and Arabic (Friginal & Mustafa 2017) abstracts. Some attention was paid to the difference between English and Russian examples of this genre (Vassileva 1995, 1998; Yakhontova 2002, 2006). However, there are few of these studies and they do not provide sufficient intradisciplinary comparisons in the Russian-English language pair. Therefore, this work aims to conduct such a cross-linguistic comparison of abstracts in geoscience written by Russian and native English scholars.

It should be noted that the notion of *nativeness* is a matter of ongoing debate (Jenkins 2000; Tribble 2017) and several researchers find the dichotomy of expert vs. apprentice writing more appropriate for comparative studies (Römer 2009; Tribble 2017). That is why, on gathering native English texts that are intended to serve as a benchmark in this study, I also considered the authors' expertise.

## 2. DISTINGUISHING FEATURES OF THE RA ABSTRACT

Research on the RA abstract has mainly been preoccupied with its rhetorical organisation and linguistic features such as tense, voice and authorial stance. It is widely accepted that in soft sciences the abstract tends to fulfil an *indicative* function. It gives the reader a general understanding of the research subject and scope, as well as of its main outcomes. However, it does not describe the method and procedure (Lorés 2004). On the other hand, an *informative* abstract, which is typical for hard sciences, copies the *Introduction–Methods–Results–Discussion* structure of a research article (see Graetz 1985; Nwogu 1990; Ventola 1994). Lorés (2004) gives evidence that indicative articles often mirror the RA *Introduction* section structure, which Swales (1990: 141) describes as the *Create a Research Space*, or *CARS*, model. The findings about the linguistic implementation of the moves are often controversial, but research agrees overall that the features may vary depending on the discipline.

Little is known about the rhetorical organisation and linguistic features of the abstract in geoscience in particular. Writing guides for geologists recommend composing informative texts with an IMRD structure, "either in that order [of moves], or with initial emphasis on findings" (Bates *et alii* 1995: 16). Nevertheless, Bates *et alii* (1995: 16) admit that broad overviews, monographs and review papers may permit only an indicative structure. Moreover, a mixture of two structures may become the best option in some cases. As regards the linguistic features, handbooks for geologists generally agree that abstracts overusing passive structures are not welcomed by scientific journals (Landes 1966; Bates *et alii* 1995; Donovan 2017). Authors are also advised not to use personal pronouns (Taylor n. d.). Therefore, the issue of authorial stance seems interesting in this case. Furthermore, the handbooks warn geoscientists against "nouniness" (e.g., *giant oil field production record data analysis diagram preliminary interpretation)* and overuse of

prepositional phrases with *of (e.g. preliminary interpretation of a Data-analysis diagram of the production record of a giant oil field)* (Bates *et alii* 1995: 8).

Research on abstracts written by Russian scholars has noticed that "the structure of Slavonic texts is looser, fuzzier and closer to that of ordinary essay writing (introduction, body, conclusion)" in comparison with the more or less fixed IMRD structure in English (Vassileva 1998: 178). Similarly, Prozorova (1997: 314) provides evidence that Russian academic discourse in general has "less emphasis on achieving maximum structural clarity" than English. In addition, Yakhontova (2002) found neither the "occupying a niche" move in Russian-language conference abstracts nor the idea of self-promotion, which is typical for the genre in the native English tradition. She believes these are the results of different social and ideological contexts of writing. Vassileva (1998) agrees about the modesty of Slavic writers. She observes a tendency in Russian authors to hide or disguise themselves, which can be deduced from a wide use of "depersonalisation", "agentless passive constructions", and "completely avoiding any personal pronouns" (Vassileva 1998: 177-178). Vassileva explains this phenomenon as an attempt by Russian researchers to produce a highly objective scientific style.

Other linguistic features of Russian abstracts have not yet received much attention. However, there are a limited number of studies dealing with differences between Russian and English academic prose in general. For example, Pyankova (1994) assumes that Russian sentences are often quite wordy and might correspond in length to two or three English sentences. Secondly, she notices a difference in the use of tenses: in Russian scientific prose, the present and the past tenses can be used equally often, while in English academic texts the preferred tense is the present. Thirdly, Pyankova (1994), in line with Vassileva (1998), makes the observation that Russian scientists avoid personal pronouns and opt for abundant passive and impersonal structures. In addition, she believes that Russian academic texts are prone to nominalisations even more than their English counterparts. According to Klimzo (2006), Russian writers do not take into account the different idiomaticity of the English language. Finally, these studies agree that Russian writers obviously have difficulties because of the sharp differences in the languages' grammatical systems, such as the absence of articles in Russian. A detailed description of the differences can be found in Monk & Burak (2001: 150-159).

It seems that the next logical step should be to prove the above-mentioned assumptions with real evidence from a specialised corpus, which is precisely the aim of this study.

## 3. METHOD

### 3.1. Biber's multidimensional analysis

This study applies corpus-based and computational techniques together with multidimensional quantitative and qualitative analysis as proposed by Biber *et alii* (1998). Such an analysis is not limited to an investigation into one particular feature, but can encompass any desired number of linguistic properties. For example, Biber *et alii* (1998: 158-168) describe a study in which over 60 features are analysed for each text. The exact number in the set is determined by the purposes of the study.

Taking into consideration the peculiarities of the abstract in Russian academic discourse and the discipline-specific traits of the abstract in geoscience, this study scrutinises the rhetorical organisation of abstracts in a specialised corpus along with the following linguistic features:

(1) self-reference words
(2) active verbs with inanimate subjects
(3) passive structures
(4) Academic English collocations
(5) articles
(6) nouns
(7) preposition *of*
(8) sentence length
(9) *wh*-clauses
(10) tense markers.

### 3.2. The corpus

The corpus designed for the purposes of this study is a monolingual written corpus of research article abstracts in geoscience. The corpus is a collection of 210 texts, which are divided into two parts. The number of tokens in each sub-corpus is 23,956 and 28,163, which makes 52,119 tokens altogether.

The first sub-corpus consists of 105 abstracts written by native English experts in geoscience in the last two decades. These texts were chosen from thirteen highly reputed geology journals with a SJR quartile score Q1 above 0.943 in 2016. Most of the journals have an average *H* index of 70 or higher in 2016, which is the journal's number of articles (*h*) that received at least h citations over this period (SCImago 2007). The texts in the sub-corpus are instances of English written by individuals or teams of authors from Great Britain, Australia, the USA and Canada. The judgements on the origin of the authors were made according to their family names and affiliation. Although a surname cannot serve as an unmistakable way to determine a writer's L1, this method was applied in a number of studies (e.g., Van Bonn & Swales 2007). It should be underlined that the authors' expertise rather than their native English-speaking status was a crucial parameter. All in all, the first sub-corpus can be conventionally called a collection of abstracts written by native English expert writers (hereinafter: *English sub-corpus*).

The second sub-corpus consists of 105 abstracts written in English by Russian students who have learned English as a foreign language and are enrolled in graduate programmes in geology in five different universities in Russia (hereinafter: *Russian sub-corpus*). The texts, which had not been previously proofread by any teachers, translators or native English speakers, constitute a corpus of genuine materials that can help uncover areas of difficulty in learners' EAP writing for a special target group of Russian students enrolled in earth sciences.

The texts gathered for the purposes of this study constitute a learner corpus, which is a relatively new and rather specific type of corpus. Such collections are peculiar because they contain data from foreign or second language learners (Gilquin *et alii* 2007). According to Grange (2002), this type of corpus has to take into account the factors that affect learner language such as learner profiles (age, proficiency level, mother tongue background, etc.) and task variables (field, genre etc.). In this study, all such parameters are considered: the

students' ages are between 18 and 22, their proficiency level is B2 according to the Common European Framework of Reference for Languages, all the authors' dominant language is Russian, the academic field is geoscience and the genre is the RA abstract.

## 4. PROCEDURE

The size of this article does not allow for the exact procedure for each dimension to be described. I therefore outline only the basic steps. The log-likelihood, chi-square test, and Fisher's exact test (where the chi-square test was not applicable due to small sample sizes) were used to decide on the statistical significance of the results.

### 4.1. Rhetorical organisation

To code the moves, I applied the framework developed by Dos Santos (1996: 481), but simplifying it by merging the original Move 1 and Move 2 from Dos Santos' pattern (Table 1).

| Move | Label | Function | Question asked |
|---|---|---|---|
| Introduction | I | Sets the general topic field, shortcomings of previous research, introducing the research and its purpose. | What is known in the field? What is the study about? |
| Method | M | Describes the study design (materials, participants, procedure etc.). | How was the research done? |
| Results | R | States the major findings. | What did the researcher find? |
| Discussion | D | Explains the significance of the research by drawing conclusions or offering recommendations. | What do the results mean? |

Table 1: Framework for coding moves in this study.

The basic unit of the moves analysis was the sentence. However, if two clauses in a sentence have two clearly different functions, the clauses were assigned to different moves.

### 4.2. Self-reference words, active verbs with inanimate subjects, and passive structures

The features that can indicate authorial stance were analysed (see a full list in Pho (2013)). These include first person pronouns and self-reference words: *I, me, my, mine, myself, we, us, our, ours, the author(s), the researcher(s)*. First of all, these elements were analysed quantitatively with the help of AntConc software (Anthony 2014). Then the examples were analysed qualitatively to ensure that they refer to the abstracts' authors. Secondly, the uses of active structures with the words *article, paper, study, research* and *work* as inanimate subjects were calculated. These words were chosen because they are probably the most widely used as the inanimate subjects in research papers (Dorgeloh & Wanner 2003). A search for regular expressions (e.g., *paper [a-z]+s\b*, *paper [a-z]+ed\b*) in AntConc (Anthony 2014) generated lists of concordance lines where the words *article,*

*paper, research, work* and *study* act as the inanimate subjects with active verbs. Furthermore, concordance lines for the words were checked manually to exclude any possible errors.

Finally, I tried to calculate the number of passive structures in the corpus. The corpus was POS-tagged using CLAWS WWW POS-tagger. First of all, I looked at the exact number of all past participles of lexical verbs (*VVN* in CLAWS C5 tagset). Then I dismissed the lines where the past participles were used to form perfect tenses in the active voice. Next passives with *done* were added, because the verb has a separate tag in the C5 tagset (*VDN*). Finally, I examined concordance lines for all lexical verbs in the past tense (*VVN*) in a search for past participles that were inaccurately labelled as lexical verbs in the past tense, and reduced passive clauses (e.g., *the data collected from Earth-like planets).* They had to be identified, checked and calculated manually. Automated extraction of passive clauses may be possible in future by generating full parse trees that identify the corresponding syntactic structures.

### 4.3. N-grams and collocations

Computational linguists and engineers use the term *N-gram* for a sequence of words that occur together with a certain frequency (Maia *et alii* 2008). *N* in this case is a number of words in a sequence. At the same time, corpus linguists call them *word clusters* (Hyland 2008), *collocations* (Sinclaire 1991; Biber *et alii* 1998) or *lexical bundles* (Biber *et alii* 2004; Chen & Baker 2010). Such multi-word units include a wide range of linguistic phenomena and go beyond the parts-of-speech level to a sentence level (e.g., *I don't think that you*) (Biber *et alii* 1998). I use the terms *N-grams* and *collocations* interchangeably in this work.

I set the following parameters to search for Academic English (AE) collocations using the AntConc program (Anthony 2014). The minimum frequency of an N-gram in the corpus was set to 3, with the minimum range of texts in which they appear also set to 3 to avoid idiosyncratic results. It was decided to look for 4-grams, which have "the most researched length for writing studies" (Chen & Backer 2010: 32). The N-grams containing proper nouns (e.g., *Russian State University of Oil and Gas*), and terms specific to the discipline (e.g., *in oil and gas*) were excluded, leaving only the expressions used in research in general (e.g., *results of the research*). Finally, overlaps (e.g., *as a result o*f and *a result of the*) were checked manually via the concordance tool and then merged into larger units (e.g., *as a result of the*) (the method is described in Chen & Baker 2010).

Then all collocations were assigned to three general structural categories. The first is *NP-based*, or a noun phrase plus post-modifier fragments (e.g., *comparative analysis of the*); the second is *PP-based*, a preposition plus a noun-phrase (e.g., *on the basis of*), and the third is *VP-based*, which means any combination with a verb (e.g., *it has been found*) (see Chen & Baker 2010).

Finally, the discourse functions of the *N*-grams found in the corpus were compared. The functional division is based on the categories outlined by Biber *et alii* (2004: 384-388).

### 4.4. Nouns, articles, preposition *of*

The number of nouns and articles in POS-tagged versions of the sub-corpora were counted with the help of the AntConc program (Anthony 2014) and then compared. The occurrences of the preposition *of* in the sub-corpora were also calculated.

### 4.5. Sentence length, *Wh*-clauses

The WordSmith Tools software (Scott 2004) showed statistical information about the mean sentence length in the sub-corpora. AntConc (Anthony 2014) assisted in calculating occurrences of *Wh*-clauses with the relative pronouns *who*, *whom*, *which*, *that* and *those*.

### 4.6. Tense

Using the concordance option in AntConc (Anthony 2014), I extracted the following combinations of verb tense and aspect from the POS-tagged version of the corpus: present simple, present continuous, present perfect, past simple and past continuous. Although these are not the only verb tenses and aspects found in the corpus, other forms were rarely found and therefore excluded.

To calculate how much each tense is used, I examined and calculated concordance lines for the following tags from the CLAWS C5 list:

| | | |
|---|---|---|
| (1) | *VBB* | the "base forms" of the verb *be* (except the infinitive), i.e. *am*, *are* |
| (2) | *VBD* | past form of the verb *be*, i.e. *was*, *were* |
| (3) | *VBZ* | *-s* form of the verb *be,* i.e. *is*, *'s* |
| (4) | *VDB* | base form of the verb *do* (except the infinitive) |
| (5) | *VDD* | past form of the verb *do*, i.e. *did* |
| (6) | *VDZ* | -s form of the verb *do*, i.e. *does* |
| (7) | *VHB* | base form of the verb *have* (except the infinitive), i.e. *have* |
| (8) | *VHD* | past tense form of the verb *have*, i.e. *had*, *'d* |
| (9) | *VHZ* | *-s* form of the verb *have*, i.e. *has*, *'s* |
| (10) | *VVB* | base form of lexical verb (except the infinitive) (e.g., *take*, *live*) |
| (11) | *VVD* | past tense form of lexical verb (e.g., *took*, *lived*) |
| (12) | *VVZ* | *-s* form of lexical verb (e.g., *takes*, *lives*). |

Reduced passive clauses, which had been previously calculated manually, were removed from the results.

## 5. RESULTS

### 5.1. Rhetorical organisation

The results mostly showed similarities between the sub-corpora. First of all, the results indicate that abstracts with a rigid IMRD structure or a mixed one (IRMD, RIMD etc.) are dominant in both sub-corpora. Moreover, the amount of them is very similar in the sub-corpora, the difference being 5.7%. According to the chi-square statistic of 0.6873 with the *p*-value of 0.407094, this is not significant. Secondly, the abstracts that omit the *Discussion* move and which have an IMR or IRM structure are equally frequent in both sub-corpora (14.30%). Thirdly, the sub-corpora have high percentages of abstracts with an I and ID structure. Although in the Russian sub-corpus this phenomenon is observed 8.5% more

often, the chi-square statistic of 2.1562 with the *p*-value of 0.141999 means the difference is not significant. Nevertheless, this type of descriptive rhetorical organisation seems typical for abstracts in geology due to its relatively high frequency in the corpus (see Table 2). Last but not least, there are sufficiently fewer abstracts that lack the *Results* move in the native English sub-corpus. Only 19.1% of native authors skipped this important part in comparison with 32.4% of Russian writers in the corpus. In this case, the chi-square statistic is 4.886. The *p*-value is <0.027075. This result is considered significant at 5%.

| Structure | Percentage in Russian sub-corpus | Percentage in native English sub-corpus |
|---|---|---|
| IMRD | 35.20% | 37.10% |
| Mixed IMRD | 9.50% | 13.30% |
| I | 16.20% | 12.40% |
| IMR(IRM) | 14.30% | 14.30% |
| ID | 11.40% | 6.70% |
| IM | 4.80% | 0% |
| IRD (IRDID) | 4.80% | 3.80% |
| IR | 0.00% | 3.80% |
| MRD | 0.00% | 4.80% |
| Other | 3,80% | 3,80% |

Table 2. The rhetorical structure of abstracts in the corpus.

### 5.2. Self-reference words, active verbs with inanimate subjects, and passive structures

#### *5.2.1. Self-reference words*

Self-reference words are certainly not the most frequent words in geoscience abstracts. Table 3 shows the percentage of occurrences of chosen self-reference words in the sub-corpora. The LL score is the log-likelihood, which shows whether the difference between the sub-corpora can be considered significant. The LL index above 3.84 means that the difference is significant at the $p < 0.05$ level.

| Feature | English sub-corpus | Russian sub-corpus | LL score |
|---|---|---|---|
| I | 0% | 0.02% | 6.22 |
| My | 0% | 0.01% | 4.66 |
| Us | 0% | 0.02% | 6.22 |
| The author | 0% | 0.02% | 6.22 |
| We | 0.23% | 0.1% | 13.57 |
| Our | 0.05% | 0.04% | 0.18 |
| The authors | 0.007% | 0.007% | 0 |
| Me, mine, myself, ours, the researcher(s) | 0% | 0% | 0 |
| Total | 0.29% | 0.23% | 1.95 |

Table 3. Percentage of occurrences of chosen self-reference words in the sub-corpora and LL score.

At first sight, it seems that the most prominent difference may be in the use of the pronoun *we*, which is much more frequent in the native English sub-corpus. This pronoun is used in 39 native English texts versus 13 Russian ones. Also, the data demonstrate that Russian students seem to use the words *I, my* and *the author* more than their English colleagues. Unfortunately, the data obtained do not allow any hypothesis to be constructed in these regards, because the sub-corpora are not well-balanced in terms of the number of authors for each text. In the Russian sub-corpus, individual authors constitute about 93% while in the native English sub-corpus there are only 18% of abstracts written by one author. This imbalance could obviously have affected the results.

However, a closer look at the distribution of *we* in the Russian sub-corpus revealed that 11 texts out of 13 where it is used belong to single authors. To be more exact, 11 texts out of 98 texts written by individual researchers in the Russian sub-corpus use the pronoun *we*. In comparison, in the native English sub-corpus the total number of texts written by single authors is 19, and only one of them has the pronoun *we*. Similarly, the pronoun *us* is used by individual Russian writers in 3 cases out of 4. Similarly, single Russian authors use *our* in 6 cases out of 10. Although individual Russian authors' tendency to use the inclusive pronouns *we, us* and *our* seems quite visible, Fisher's exact test did not prove that English geologists resort to this strategy less. The Fisher's exact test statistic value of 0.189725 implies that the result is not significant at $p < 0.05$. Finally, the searches for the words *our, the authors, me, mine, myself, ours* and *the researcher(s)* gave zero or a very small number of hits. The difference in results is not significant. The data prompt the conclusion that both English experts and Russian novice writers prefer to avoid these words in RA abstracts.

### *5.2.2. Active verbs with inanimate subjects*

*Table 4* illustrates that the most significant difference is observed in the use of the words *article*, *paper* and *work* as inanimate subjects. Russian geologists seem to use them much more often. The LL index above 3.84 means that the difference is significant at the level of $p < 0.05$.

| Feature | Native English sub-corpus | Russian sub-corpus | LL score |
|---|---|---|---|
| *Article* | 0% | 0.03% | 4.82 |
| *Paper* | 0.03% | 0.13% | 17.37 |
| *Study* | 0.03% | 0.02% | 0.60 |
| *Research* | 0% | 0% | 0 |
| *Work* | 0.01% | 0.05% | 9.63 |
| Total | 0.07% | 0.23% | 22.21 |

Table 4. Percentage of hits for *paper, study, research* and *work* as inanimate subjects, and the LL score.

### *5.2.3. Passive structures*

The data regarding passive structures in the corpus (Table 5) indicate that these structures are equally frequent in both sub-corpora. The LL index above 3.84 means that the difference is significant at the level of $p < 0.05$.

| Feature | Native English | Russian | LL score |
|---|---|---|---|
| *VVN* | 2.73% | 3% | 3.23 |
| *VHB+VVN* | 0.06% | 0.06% | 0.01 |
| passive *VDN* | 0% | 0.03% | 7.39 |
| reduced clauses with *VVD* | 0.14% | 0.08% | 4.18 |
| Total | 2.94% | 3.17% | 2.53 |

Table 5. Distribution of passive structures within the sub-corpora.

### 5.3. Academic English collocations

#### *5.3.1. Quantitative data*

First and foremost, there is a striking difference in the number of 4-grams that can be considered AE collocations. The list of retrieved and refined 4-grams from the native English sub-corpus consists of only 9 collocations, compared to 28 in the Russian sub-corpus. Secondly, there is only one co-occurrence, and it is the most frequent collocation in the sub-corpora: *as a result of.* Other AE collocations in the sub-corpora do not coincide.

#### *5.3.2. Qualitative data*

The chi-square test showed no significant difference in distribution of N-grams according to their structure: the chi-square statistic is 5.0084 and the *p*-value is 0.171185. The result is not significant at $p < 0.05$. (Table 6).

| | NP-based | VP-based | PP-based | other | Row Totals |
|---|---|---|---|---|---|
| Russian sub-corpus | 8 (6.81) [0.21] | 15 (13.62) [0.14] | 4 (6.05) [0.7] | 1 (1.51) [0.17] | 28 |
| Native English sub-corpus | 1 (2.19) [0.65] | 3 (4.38) [0.43] | 4 (1.95) [2.17] | 1 (0.49) [0.54] | 9 |
| Column Totals | 9 | 18 | 8 | 2 | 37 (Overall Total) |
| n - the observed number of N-grams<br>(n)-the expected totals<br>[n]-the chi-square statistic for each cell | | | | | |

Table 6. Distribution of N-grams according to their structure.

As regards the functional categorisation, the chi-square test did not prove that there is any difference in the distribution of discourse functions among the AE collocations in the sub-corpora (Table 7).

| | Referential Expressions | Stance Expressions | Discourse Organising | Row Totals |
|---|---|---|---|---|
| Russian sub-corpus | 12 (12.11) [0.00] | 8 (8.32) [0.01] | 8 (7.57) [0.02] | 28 |
| Native English sub-corpus | 4 (3.89) [0.00] | 3 (2.68) [0.04] | 2 (2.43) [0.08] | 9 |
| Column Totals | 16 | 10 | 11 | 37 (Grand Total) |
| n - the observed number of *N*-grams<br>(n)-the expected totals<br>[n]-the chi-square statistic for each cell | | | | |

Table 7. The distribution of discourse functions among the 4-grams in the sub-corpora.

### 5.4. Nouns, articles and the preposition *of*

The results, summarised in *Table 8* below, suggest that the level of nominalisation may be higher in the Russian sub-corpus. Interestingly, there are approximately two times more proper nouns in the native English sub-corpus. Nevertheless, the Russian sub-corpus outstrips the English one in the number of singular and plural nouns. The LL index above 3.84 means that the difference is significant at the $p < 0.05$ level.

| Feature | Native English sub-corpus | Russian sub-corpus | LL score* |
|---|---|---|---|
| Noun neutral for number | 0.93% | 0.72% | 7.08 |
| Proper noun | 3.41% | 1.59% | 172.93 |
| Singular noun | 20.53% | 23.25% | 43.85 |
| Plural noun | 7.72% | 8.54% | 10.66 |
| Total | 32.59% | 34.1% | 8.87 |

Table 8. The percentages of nouns in the sub-corpora.

The results indicate an overuse of the preposition *of* in the Russian sub-corpus. The relative frequency of the preposition in the native English sub-corpus is 4.40%, compared to 5.92% in Russian. The LL score is very high in this case (58.7), which means that the result is not likely to be random, and the difference is statistically significant.

The calculations do not confirm that there is a significant difference in the number of articles in the sub-corpora. The log-likelihood scores for definite and indefinite articles are 2.14 and 0.96 correspondingly, which makes the difference insignificant.

### 5.5. Sentence length and relative clauses

Table 9 illustrates that there is no significant difference between the sub-corpora as regards sentence length and the number of subordinate clauses. Still, it might be interesting to look closer at the subordinate clauses with *which* and *that*, because the percentage of their

occurrences in the sub-corpora is significantly different. *Which* is used nearly two times more frequently in the Russian sub-corpus. In contrast, *that* is significantly more often used in the native English sub-corpus.

| Feature | English sub-corpus | Russian sub-corpus | LL score |
|---|---|---|---|
| Mean sentence length | 22,47327042 | 21,11051369 | 0,02 |
| *Who*-clause | 0% | 0.01% | 3.11 |
| *Whom*-clause | 0% | 0% | 0 |
| *Which*-clause | 0.25% | 0.47% | 18.35 |
| *That*-clause | 0.89% | 0.66% | 9.05 |
| *Whose*-clause | 0% | 0% | 0.01 |
| Total | 1.14% | 1.14% | 0.0 |

Table 9. Mean sentence length and the percentage of subordinate clauses in the sub-corpora. The LL index above 3.84 means that the difference is significant at the $p < 0.05$ level.

### 5.6. Tense

The results indicate that the preferred tense in both sub-corpora is the present tense. The past tense in the Russian sub-corpus in used significantly less frequently than in the native English sub-corpus, and the present significantly more (see Table 10).

| Feature: | Occurrences in native English sub-corpus | Occurrences in Russian sub-corpus | Percentage in native English sub-corpus | Percentage in Russian sub-corpus | LL score |
|---|---|---|---|---|---|
| *Are* | 189 | 201 | | | |
| *Is* | 254 | 392 | | | |
| *do/does* (*not*) | 15 | 12 | | | |
| *Have* | 58 | 56 | | | |
| *Has* | 71 | 81 | | | |
| Base form of lexical verb (except the infinitive) (e.g., *go*) | 466 | 222 | | | |
| -s form of lexical verb (e.g., *goes*) | 306 | 322 | | | |
| Total present: | 1,359 | 1,286 | 4.83% | 5.73% | 7.49 |
| *Was/were* | 192 | 149 | | | |
| *Had* | 13 | 2 | | | |
| Past tense form of lexical verb (e.g., *went*) | 178 | 82 | | | |
| *Did/did not* | 5 | 1 | | | |
| Total past: | 3,88 | 2,34 | 1.38% | 0.98% | 17.68 |

Table 10. Frequency of the features indicating tenses in the corpus.

## 6. CONCLUSIONS

In this paper, I have explored the rhetorical organisation and several linguistic features of the RA abstract in geoscience. A specialised corpus was designed to study similarities and differences between Russian and English practices in this field, especially since discourse-analytic work on written genres in Russian academic tradition was surprisingly scarce. The results lead to the conclusions summarised below.

### 6.1. Rhetorical organisation

First of all, it was found that most abstracts written by native English experts in the corpus have an IMRD (37.1%) or mixed IMRD (13.3%) structure. These results confirm the earlier findings that abstracts in hard sciences tend to have an IMRD structure (Stotesbury 2003). These data are also in line with the prescriptive recommendations found in textbooks for geologists (Bates *et alii* 1995). Secondly, there is a high percentage of abstracts in the native English sub-corpus that skip the *Discussion* move (14.5%). This unwillingness of expert geoscientists to discuss the results probably deserves further investigation. Finally, there are quite a number of abstracts in the native English sub-corpus that generally have only I or ID moves (14.3% and 6.7% correspondingly), which means they fulfil the indicative function rather that the informative one. This finding corresponds with the assumption by Bates *et alii* (1995) that the indicative structure might be the best option for abstracts accompanying broad overviews, monographs and review papers.

Furthermore, this study revealed that Russian students implemented the same rhetorical patterns as native English experts did. This finding contradicts the previous claim that the structure of Slavic abstracts is rather indistinct (Vassileva 1998). Probably, owing to the fact that Russian scholars are no longer in isolation and have access to internationally recognised journals, the native English academic standards have become more transparent for them since the 90s, when Vassileva (1998) published her study.

In addition, the results indicate that Russian authors seem to skip the *Results* move much more often than their native English colleagues. Martín (2003) noticed the same tendency in a corpus of Spanish abstracts. He explains this by the influence of socio-cultural factors such as "different intellectual styles and cultural patterns, the influence (or lack) of academic writing instruction, or political and historical circumstances" (Martín 2003: 42). The lack of academic writing instruction seems to be a plausible reason. All Russian authors in the corpus are students, some of them in their first year, and they may not yet have achieved any visible results in their studies or have honed the necessary EAP writing skills. From this perspective, it could be interesting to compare their texts to native English non-expert abstracts.

The results related to the rhetorical structure are subject to the following limitations. First of all, the number of examples is rather small in the corpus, so larger corpus studies are necessary to confirm the results. Secondly, it is not always easy to determine a clear boundary between moves, which can be explained by the condensed nature of an abstract (Pho 2013). Obviously, some moves might have been labelled wrongly in this study. To get more plausible data, other researchers should be asked to identify the moves, and maybe even native English experts in geology, to get precise information.

### 6.2. The authorial stance

In general, the percentage of self-reference words is quite small in the native English sub-corpus (0.29%). Passive structures, on the other hand, are more frequent (2.94%). The data confirm the assumption by Hyland (2011) that in hard sciences the author's presence is not really necessary because facts speak for themselves. This is also in line with advice from writing guides for geoscience students (Taylor n.d.).

A comparison of the sub-corpora showed that passive structures are similarly widespread in them. In addition, most self-reference words are used equally rarely by Russian and English authors. Still, some difference is observed in the numbers of *we, I, my,* and *the author*, though this can be simply explained by an imbalance between single and group authors in the sub-corpora. This oversight must be considered in further studies. In spite of the imbalance, the data allows us to conclude that Russian novice writers in geoscience tend to use the *inclusive* pronouns *we*, *us* and *our*. The term *inclusive* means that the pronouns refer to the writer and reader together (Harwood 2005). The practice of single authors using *we* in their texts is common in native English academic tradition, and in hard science in particular (Swales & Feak 2012; Hyland 2011; Yakhontova 2006). Research considers that inclusive pronouns are examples of "low-risk, discrete instances of textual authorial intervention" (Harwood 2005: 344). Hence, these data confirm the assumptions of Pyankova (1994) and Vassileva (1998) that Russian writers tend to disguise themselves. However, although in the Russian sub-corpus this tendency is quite visible, the data are insufficient to conclude that native English authors use this strategy less. A larger corpus study with a more balanced number of abstracts written by individuals and groups may further clarify the issue.

Finally, the results suggest that Russian geologists use the "*paper strategy"* (Dorgeloh & Wanner 2003: 443) significantly more than their native English colleagues. This strategy consists of using the "active voice, while avoiding explicit reference to the agent [...] the article itself takes the position of subject" Dorgeloh & Wanner (2003: 443). Usually such words as *paper, study, article,* and *research* are followed by "reporting verbs" that lead the readers through argumentation lines: *report, analyse, present, discuss, explain, show* etc. (Dorgeloh & Wanner 2003: 441). Examples of such a "paper" strategy would be: *This paper presents... This article reports... This study examines* etc. (Dorgeloh & Wanner 2003: 441-443). This strategy probably offers non-native writers a safe way to organise their discourse.

### 6.3. AE collocations

Interestingly, Russian students use three times more four-word AE collocations than English experts in the corpus. Given the small size of the corpus, it would be too bold to make a generalisation that abstracts in geoscience in native English academic discourse tend to lack AE collocations. Moreover, the method applied in this work did not take into account 3-grams, which might be an important omission. Still, the result supports Hyland's (2008) finding that the least proficient students relied on formulaic expressions more than expert writers. Nonetheless, it contradicts the studies by De Cock (2004) and Chen & Baker (2010), who conclude that expert writing shows a wider range of lexical bundles compared to L2 student writing. A larger corpus study could shed some light on this controversy.

In addition, only one collocation coincided in the results. This fact suggests that there might be wrong collocation patterns in Russian RA abstracts. Further qualitative and quantitative studies are certainly needed to corroborate or refute this hypothesis.

### 6.4. Articles, nouns and the preposition *of*

Firstly, the results show that there is no significant difference in the number of articles in the sub-corpora, in spite of the fact that this grammatical category does not exist in Russian language. On the contrary, Tribble (2017) provides evidence that missing and redundant determiners are among the most frequent errors in non-native EAP writing. Further qualitative studies (perhaps by native English researchers) may help to interpret the data.

Secondly, there are significantly more nouns in the Russian sub-corpus. As circumstantial evidence of a high nominalisation level, the preposition *of* is overused in the Russian sub-corpus. This "nouniness", as Bates *et alii* (1995: 8) call it, can be explained by an influence from the Russian scientific style. As Pyankova (1994) observes, Russian academic texts are prone to nominalisations even more than English.

### 6.5. Sentence length and relative clauses

Sentences in the Russian and native English sub-corpora are of a similar length and have a similar number of subordinate *wh*-clauses. This finding is not in line with Pyankova's (1994) observation that Russian sentences in scientific texts are often quite wordy and might correspond in length to two or three English sentences. The discrepancy between the findings only confirms the need for more present-day cross-linguistic and intradisciplinary studies of EAP genres.

### 6.6. Tense

The authors in the sub-corpora prefer to use the present tense. This is in line with the earlier study by Abarghooeinezhad & Simin (2015), who found the preference for the present tense in abstracts in engineering. They believe this tense choice is an implicit message from the authors that their research has brought some indisputable, established results. However, this finding in the current study contradicts Graetz's (1985) assumption that the use of the past tense is a universal distinguishing linguistic feature of RA abstracts. At least the use of tense should be considered discipline-specific, as noted by Swales & Feak (2000). The finding contradicts the claim that in Russian scientific prose the present and past tenses can be used equally often, while in English academic texts the preferred tense is the present (Pyankova 1994). Maybe this remark is fair in relation to Russian scientific prose in general, but not to the abstract in geoscience in particular. A larger corpus study could cast some light on this issue.

### 6.7. Limitations

This study has a number of limitations, which were voiced earlier in the *Conclusions*. In essence, given the small number of texts involved, it is clearly not possible to make overall

generalisations about "Russian English" or of the genre of a research article in geoscience. However, the corpus offers real examples of a particular discourse and therefore allows further hypotheses to be generated about the ways Russian and native English geologists understand the genre of abstract, what structures and AE collocations they use, how they place themselves within the text, and what errors in non-native EAP writing could be labelled as systematic. These hypotheses might then be proven by larger corpus studies and other scientific methods.

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